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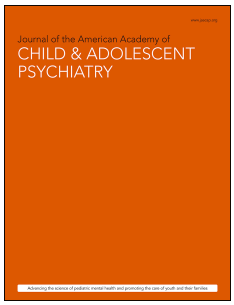

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RH = Bullying and Suicide Attempt

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Editorial
Supplemental material

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Drs. Koyanagi and Haro are with the Research and Development Unit, Parc Sanitari Sant Joan de Déu, Universitat de Barcelona, Fundació Sant Joan de Déu, Barcelona, Spain, and the Instituto de Salud Carlos III, Centro de Investigación Biomédica en Red de Salud Mental, CIBERSAM, Madrid, Spain. Dr. Oh is with the University of Southern California, Suzanne Dworak-Peck School of Social Work, Los Angeles, CA. Dr. Carvalho is with the Centre for Addiction & Mental Health (CAMH), Toronto, Ontario, Canada. Dr. Smith is with The Cambridge Centre for Sport and Exercise Sciences, Anglia Ruskin University, Cambridge, UK. Dr. Vancampfort is with KU Leuven Department of Rehabilitation Sciences, Leuven, Belgium and KU Leuven, University Psychiatric Center KU Leuven, Leuven-Kortenberg, Belgium. Dr. Stubbs is with South London and Maudsley NHS Foundation Trust, Denmark Hill, London, UK, the Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK, and the Faculty of Health, Social Care and Education, Anglia Ruskin University, Chelmsford, UK. Dr. DeVylder is with the Graduate School of Social Service, Fordham University, Bronx, NY.

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Abstract

Objective: Adolescent suicide is a global public health problem. Bullying is a risk factor for suicidality in adolescence; however, global data on its association with suicide attempts are lacking, and data from low- and middle-income countries (LMICs) and non-Western settings are scarce. Thus, we assessed the association between bullying victimization and suicide attempts using data from 48 countries (predominantly LMICs) across multiple continents.

Method: Data from the Global School-based Student Health Survey were analyzed. Data on past 12-month suicide attempts and past-30 day bullying victimization were collected. Multivariable logistic regression and meta-analysis with random effects were conducted to assess the associations.

Results: The final sample consisted of 134,229 adolescents aged 12-15 years. The overall prevalence of suicide attempts and bullying victimization were 10.7% and 30.4%, respectively. After adjustment for sex, age, and socioeconomic status, bullying victimization was significantly associated with higher odds for a suicide attempt in 47 of the 48 countries studied with the pooled OR being 3.06 (95%CI=2.73-3.43). Greater number of days bullied in the past month was dose-dependently associated with higher odds for suicide attempts. The past-year prevalence of suicide attempts ranged from 5.9% for the “no bullying” group up to 32.7% for the “being bullied for 20-30 days/month” group [OR=5.51 (95%CI=4.56-6.65)].

Conclusion: Bullying victimization may be an important risk factor of suicide attempts among adolescents globally. Thus, there is an urgent need to implement effective and evidence-based interventions to address bullying in order to prevent suicides and suicide attempts among adolescents worldwide.

Key words: suicide attempt, peer victimization, bullying, global health

Introduction

Suicide imposes a large economic, social, and psychological impact at an individual, family, and country-level. Suicide prevention is now an integral part of the Mental Health Action Plan of the World Health Organization (WHO), with the goal of reducing the rate of suicide in each country by 10% between 2012 and 2020.[1] Although suicide can occur throughout the life course, adolescent suicide is a particularly major public health concern as suicide and accidental deaths from self-harm are the third leading cause of death among adolescents worldwide, resulting in approximately 67,000 deaths per year.[2] Furthermore, suicide is the leading or second leading cause of death in some subpopulations such as adolescent girls and adolescents in Europe and South-East Asia.

Having a prior suicide attempt is the single most important risk factor for suicides in the general population.[1] Among adolescents, a prior suicide attempt has been associated with a 30-fold increased risk for completed suicide among boys.[3] Although non-fatal, suicide attempts can result in significant medical, social, and economic burden, requiring expenditures for health services to treat injuries and to also treat subsequent long-term disabilities. Suicide attempts can also have a profound psychological effect on the individual and families. In addition, adolescents who have attempted suicide are at higher risk for mental health problems, substance misuse, physical health problems, engagement in violence, and premature death in adulthood.[4-6] Thus, there is an urgent need to identify risk factors for suicide attempts to implement effective and evidence-based interventions at population and individual levels to prevent suicide attempts and also completed suicides.

Among adolescents, bullying victimization, in particular, has gained increasing attention as a risk factor for adolescent suicides in the wake of several highly publicized adolescent suicides that appeared to be directly linked to incidents of bullying exposure. Bullying can be defined as repeated undesired aggressive behaviors perpetrated by a peer or a

group of peers that involve a power imbalance favoring the perpetrator,[7] and can take verbal (teasing and calling names), relational (excluding and spreading rumors), or physical (physical threats and harm) forms.[8] Based on a meta-analysis including 80 studies, approximately 36% of adolescents experience bullying.[9]

Although there are multiple studies on bullying victimization and suicidal ideation from various regions of the world including low- and middle-income countries (LMICs),[10] there are relatively few adolescent studies on bullying and suicide attempts, which is a much more serious condition than suicidal ideation. One recent meta-analysis, which included data from nine studies from four high-income countries (Sweden, USA, New Zealand, Ireland) and one LMIC (South Africa), showed that victims of bullying were at a 2.55 times higher odds for suicide attempts.[11] More recently, a multi-country study including 10 European countries found that relational victimization was associated with a 1.26 times higher odds for suicide attempts.[12] Finally, one recent longitudinal study from Canada found that bullying victimization at age 13 was associated with a 3.05 times higher odds for suicide attempts two years later.[13] These previous studies on bullying victimization and suicide attempt among adolescents are mostly from high-income countries (mainly Western countries), while the few from LMICs only used data from a single LMIC,[14-17] or several LMICs from Western Pacific Island countries[18] or Latin America.[19] Importantly, there are no published global data on this topic spanning multiple continents using comparable data across countries, and more studies particularly from LMICs are necessary as the vast majority of young individuals reside in LMICs, and the suicide rate among younger individuals is higher in LMICs.[1]

Thus, the aim of the current study was to (a) assess the prevalence of suicide attempt and bullying; and (b) examine the association between bullying victimization [including type (e.g., physical bullying, exclusion) and intensity (number of days bullied in past 30 days)] and suicide attempt. To do so, we examined data from the Global School-based Student

Health Survey (GSHS), which included data from 48 countries from five WHO regions that predominantly consist of LMICs (African Region, Region of the Americas, Eastern Mediterranean Region, South-East Asia Region, Western Pacific Region). To the best of our knowledge, this is the largest and most globally representative study of bullying and suicide attempts among adolescents to date.

Method

The survey

Publicly available data from the GSHS were analyzed. Details on this survey can be found at http://www.who.int/chp/gshs and http://www.cdc.gov/gshs. Briefly, the GSHS was jointly developed by the WHO and the US Centers for Disease Control and Prevention (CDC), and other UN allies. The core aim of this survey was to assess and quantify risk and protective factors of major non-communicable diseases. The survey used a standardized two-stage probability sampling design for the selection process within each participating country. For the first stage, schools were selected with probability proportional to size sampling. The second stage involved the random selection of classrooms which included students aged 13-15 years within each selected school. All students in the selected classrooms were eligible to participate in the survey regardless of age. Data collection was performed during one regular class period. The questionnaire was translated into the local language in each country and consisted of multiple choice response options; students recorded their response on computer scannable sheets. All GSHS surveys were approved, in each country, by both a national government administration (most often the Ministry of Health or Education) and an institutional review board or ethics committee. Student privacy was protected through anonymous and voluntary participation, and informed consent was obtained as appropriate

from the students, parents and/or school officials. Data were weighted for non-response and probability selection.

From all publicly available data, we selected all nationally representative datasets that included the variables pertaining to our analysis. If there were more than two datasets from the same country, we chose the most recent dataset. A total of 48 countries were included in the current study. The characteristics of each country including the survey year, country income level, response rate, sample size, and demographics are provided in **Table 1**. For the included countries, the survey was conducted between 2009 and 2015, and consisted of 9 high-income, 33 middle-income, and 6 low-income countries.

Suicide attempt *(dependent variable)*

Suicide attempt was assessed by the question "During the past 12 months, how many times did you actually attempt suicide?" and was defined as at least one suicide attempt in the past 12 months.

Bullying victimization *(independent variable)*

First, the students were provided the following definition of bullying: "Bullying occurs when a student or group of students say or do bad and unpleasant things to another student. It is also bullying when a student is teased a lot in an unpleasant way or when a student is left out of things on purpose. It is not bullying when two students of about the same strength or power argue or fight or when teasing is done in a friendly and fun way." Subsequently, bullying victimization was assessed by the question "During the past 30 days, on how many days were you bullied?" with answer options 0, 1-2, 3-5, 6-9, 10-19, 20-29, and all 30 days. Those who were bullied on at least 1-2 days were considered to be a victim of bullying. We also created a five-category variable from these answer options (i.e., 0, 1-2, 3-5, 6-19, 20-30

days) to indicate intensity of bullying. Some of the categories from the original answer options had to be collapsed with other categories due to small numbers. Another question asked on the type of bullying that was most often experienced (e.g., made fun of race, nationality, or color, left out of activities on purpose or completely ignored). Data on type of bullying were not available from Bangladesh and Morocco. Notably, self-reported childhood victimization has recently been shown to be more strongly predictive of adolescent mental health difficulties compared to objective frequency measures.[20]

Control variables

Sex, age, and food insecurity (i.e., proxy for socioeconomic status) were used as control variables in the analysis. Food insecurity was used as a proxy for socioeconomic status as there were no variables on socioeconomic status in the GSHS.[21] Specifically, this was assessed by the question "During the past 30 days, how often did you go hungry because there was not enough food in your home?" Answer options were categorized as 'never', 'rarely/sometimes', and 'most of the time/always'.

Statistical analysis

Statistical analyses were performed with Stata 14.1 (Stata Corp LP, College station, Texas). As in previous studies using the same dataset,[22, 23] we restricted the analysis to those aged 12-15 years as most students were within this age range and data on the exact age out of this age range was not provided. We used logistic regression analysis to estimate the association between bullying victimization (independent variable) and suicide attempt (dependent variable) by each country. To assess the level of between-country heterogeneity, the Higgin's I^2 statistic was calculated based on country-wise estimates. I^2 values of 25%, 50%, and 75% are often considered low, moderate, and high level of heterogeneity, respectively.[24] A pooled

estimate was obtained by combining the estimates for each country into a random effect meta-analysis. This analysis was done using the overall sample and sex-stratified samples. We conducted sex-stratified analysis as a previous study showed that the effect of bullying on suicidality may differ by sex.[25] Using the same method, we estimated the pooled estimate for suicide attempt by type of bullying and number of days bullied in the past 30 days (0, 1-2, 3-5, 6-19, and 20-30 days). Finally, in order to assess the extent to which the association between bullying victimization and suicide attempts can be explained by loneliness,[26] we also calculated the overall pooled estimate using the same method adjusting for loneliness. Loneliness was assessed with the question "During the past 12 months, how often have you felt lonely?" with answer options 'never', 'rarely', 'sometimes', 'most of the time', and 'always'. As in a previous GSHS publication, this variable was dichotomized as never, rarely, sometimes (coded=0) and most of the time, always (coded=1).[27]

All regression analyses were adjusted for age, sex, and food insecurity (proxy of socioeconomic status) with the exception of the sex-stratified analyses, which were not adjusted for sex. All variables were included in the regression analysis as categorical variables with the exception of age (continuous variable). Under 1.3% of the data were missing for all the variables used in the analysis with the exception of bullying (6.1%). Of the 134,229 adolescents aged 12-15, there were 123,157 who provided complete information on all the variables used in the regression analysis (i.e., suicide attempt, bullying, age, sex, and food insecurity). Although the age distribution of those who provided complete information and those who did not was similar, the prevalence of suicide attempts (17.3% vs. 10.2%), bullying victimization (39.7% vs. 30.2%), male sex (53.7% vs. 50.9%), and hungry 'most of the time/always' (10.0% vs. 6.8%) was higher among those who did not provide complete data. We conducted complete case analysis as the dataset did not include variables that can precisely predict the missing values and also because we had no information on whether the

data were missing at random.[28] Sampling weights and the clustered sampling design of the surveys were taken into account to obtain nationally representative estimates. Results from the logistic regression analyses are presented as odds ratios (ORs) with 95% confidence intervals (CIs). The level of statistical significance was set at $p<0.05$.

Results

The final sample consisted of 134,229 adolescents aged 12-15 years with a mean (SD) age of 13.8 (0.95) years and 51.1% were male adolescents. The overall prevalence of past 12-month suicide attempt was 10.7% (boys 10.0%; girls 11.2%) and ranged from 3.9% (Indonesia) to 60.7% (Samoa) (**Figure 1**, **Table 2**). The corresponding figure for past 30-day bullying victimization was 30.4% [range 13.2% (Laos) to 74.2% (Samoa)] (boys 32.5%; girls 28.1%). Overall, 18.7%, 6.0%, 3.5%, and 2.2% of the adolescents were bullied 1-2, 3-5, 6-19, and 20-30 days in the past 30 days, respectively. The predominant type of bullying ranged widely between countries (see Table S1, available online). For example, physical bullying was very common in Mozambique (48%), and being made fun of race, nationality, or color was highly prevalent in countries such as Benin, Samoa, and Cambodia (>20%). Countries with higher prevalence of bullying victimization tended to also have higher prevalence of suicide attempts (Figure 1, see Figure S1, available online). Overall, bullying victimization was associated with significantly higher odds for suicide attempt in all countries with the exception of Afghanistan with the pooled OR (95%CI) being 3.06 (2.73-3.43) (**Figure 2**). Overall, there was a high level of between-country heterogeneity (Higgin's I^2=79.1%). The overall estimates by regions, and for boys (see Figure S2, available online) and girls (see Figure S3, available online) were similar [boys OR=3.26 (95%CI=2.90-3.66); girls OR=2.92 (95%CI=2.60-3.28)]. The pooled estimate using the overall sample was attenuated to 2.73 (95%CI=2.42-3.07) when adjusted for loneliness (data shown only in text). In terms of

different forms of bullying, overall, compared to those who were not bullied, those who were predominantly bullied because of religion (OR=4.56; 95%CI=3.61-5.77) had the highest odds for suicide attempts followed by bullying because of race, nationality, or color (OR=3.92; 95%CI=3.41-4.50), physical bullying (OR=3.36; 95%CI=2.96-3.82), sexual bullying (OR=2.92; 95%CI=2.56-3.33), exclusion (OR=2.68; 95%CI=2.21-3.26), and made fun of physical appearance (OR=2.34; 95%CI=2.07-2.66) (data shown only in text). Finally, greater number of days being bullied was associated with increasingly higher prevalence or odds for suicide attempt among both boys and girls (**Figure 3**). In the overall sample including both boys and girls, compared to those who were not bullied in the past 30 days, those who were bullied for 1-2, 3-5, 6-19, and 20-30 days had a 2.39 (95%CI=2.12-2.70), 3.65 (95%CI=3.04-4.40), 4.89 (95%CI=4.20-5.60), and 5.51 (95%CI=4.56-6.65) times higher odds for suicide attempts, respectively (data shown only in text). Finally, given that there were some countries with exceptionally high prevalence of bullying victimization and suicide attempts, we conducted sensitivity analysis by excluding the three countries (Kiribati, Solomon Islands, Samoa) which were identified as outliers based on the >1.5(Interquartile range) above the 75th percentile criterion[29] in terms of the prevalence for bullying victimization and/or suicide attempts. The results of this sensitivity analysis were very similar to those of the original analysis (data not shown).

Discussion

In our sample of adolescents aged 12-15 years, we found a high prevalence of past 12-month suicide attempt (10.7%) and past 30-day bullying victimization (30.4%), although prevalence varied greatly between countries. Being bullied for at least one day in the past 30 days was associated with a more than 3-fold higher odds for suicide attempt overall. Greater number of days bullied was associated with increasing odds for suicide attempt. The strengths of the

study include the use of nationally representative samples of adolescents attending school, the large sample size, and the global scope including data from 48 predominantly LMICs covering five WHO regions. To the best of our knowledge, this is the first multi-continent study on bullying and suicide attempts, and provides new information on this association from countries where data were previously not available.

The overall prevalence of bullying victimization was similar to estimates based on a meta-analysis of 80 studies among adolescents which reported a prevalence of 36%, although the prevalence varied widely between studies,[9] similar to differences between countries in our study. Our overall estimate of suicide attempts was similar to the figure reported in the Youth Risk Behavior Surveillance System (YRBSS) 2013 which reported a past 12-month suicide attempt prevalence figure of 8%.[30] The wide variation in the prevalence of suicide attempts by country may be related to differences in cultural, religious, and economic background.[31] The particularly high rate of suicide attempts among young individuals in the Western Pacific may be related with psychosocial stress related with intergenerational conflict within the family, and change in traditional values.[32, 33]

Our overall estimate for the association between bullying victimization and suicide attempts was similar to those obtained from a meta-analysis that included data from four high-income countries and one LMIC (OR=2.55; 95%CI=1.95-3.34),[11] providing converging evidence that this may truly be a global phenomenon. The association between bullying victimization and suicide attempts may be mediated by factors such as depression, low self-esteem, hopelessness, loneliness, or exacerbation of the effects of an adverse family environment (i.e., domestic violence, maladaptive parenting).[26, 34] Depression is found in 49% to 64% of adolescent suicide victims,[35] while bullying victimization has been shown to be a strong predictor of depression.[26] One study found that being victimized in childhood was independently associated with increased risk for self-harm in late adolescence, but that an

indirect effect via depression was also found.[34] As for loneliness, when this factor was included in the analysis, only a small attenuation was observed in the OR suggesting that this may not be a major mediator in the association between bullying victimization and suicide attempts. Finally, peer victimization may also lead to hypothalamic-pituitary-adrenal axis dysfunction,[36] which in turn, may increase risk for suicidal behavior.[37]

Although bullying victimization was significantly associated with higher odds for suicide attempts in all but one country in our study, there was a high level of between-country heterogeneity observed. The reason for this is unclear but may be related to factors such as accessibility to means of suicide (e.g., firearms, pesticides), availability of mental health care, degree of social ties and parental understanding (which may affect one's ability to cope with life stressors), types or intensity of bullying, percentage of those who identify as sexual minorities, or cultural or social acceptability of suicide that may differ between countries and cultures, which may be variably permissive of impulsive behavior. For example, studies have shown that bullying victimization is more prevalent among lesbian and gay youth.[38] The social acceptability of non-heterosexual identities can vary across countries, and can shape the amount of bullying one is exposed to, how stigmatized/isolated one feels, and how many resources one has access to. Future studies should assess the factors that may lead to between-country differences.

Efforts to reduce bullying especially at school may be fundamental to prevent or reduce adolescent suicides. A meta-analysis found that school-based anti-bullying programs can only reduce bullying victimization by an average of 17-20%,[39] highlighting the need to develop other interventions such as screening for bullying. With respect to victims of bullying, it has been suggested that interventions to enhance coping and problem-solving skills for psychological distress associated with bullying, increase social connectedness, improve conditions within the home, and cultivate inclusive and safe environments/spaces in

schools may be effective.[40] Mental health practitioners should consider bullying as an important potential risk factor for suicide attempts.

Our findings should be interpreted in the light of several potential limitations. First, the study relied on self-reported data, although there is some evidence that it is an individual's perception of violence or danger that is most relevant to mental health,[20] which supports the use of self-report for indicators of violence exposure. Second, the use of the same informant for both bullying victimization and suicide attempts may have inflated effect sizes due to same-method variance.[41] Specifically, it has been shown that effect sizes tend to be larger when the source of information on victimization and maladjustment is the same informant than when different informants are used. It has been hypothesized that this stronger correlation based on the same informant may be related to the tendency of children who have negative feelings toward one aspect of life to also have negative feelings for other aspects of life, or the tendency of depressed children to recall negative events more often. Third, the exceptionally high prevalence of bullying victimization or suicide attempts in countries such as Samoa point to the possibility that some of the variation in the prevalence across countries may also be attributable to different cultural understandings of the questions, as the interpretation of concepts such as suicides or bullying may differ across cultures and languages. Fourth, varying degrees of bias may have been introduced by interviewing only schoolchildren, especially in countries where schooling attendance rates are low. Nonetheless, the majority of adolescents aged 12–15 years from most of the countries in our study attend school.[42] In addition, victims of bullying have been reported to also be victims of other types of violence such as child maltreatment and sexual assaults for which data were not available.[7] Since these factors may also increase risk for suicidal behavior, some level of residual confounding may exist. Next, due to a lack of data, we were unable to assess the potential mediating effect of depression, hopelessness, or low self-esteem in the bullying

victimization-suicide attempt association, or whether this association is exacerbated by an adverse family environment. At least in terms of depression, a previous study showed that self-harm was not a consequence of depression in a significant proportion of youth who were bullied.[34] Furthermore, although the percentage of missing values in this dataset was relatively low, those who were missing any of the variables included in the regression analysis were more likely to be boys, hungry 'most of the time/always', bullied, and have attempted suicide. Thus, some level of bias may have been introduced due to missing data. We also did not have information specifically on cyberbullying which may be increasing in LMICs with wider availability of the Internet. In addition, in line with previous studies using the same dataset, we defined bullying victimization as being bullied at least once in the past 30 days. Although there is no consensus in terms of the frequency or intensity of bullying for an individual to be considered a victim of bullying, it is possible that those who were bullied only once or twice in the past 30 days were victims of aggressive behavior that may not be of sufficient frequency/intensity to fit some definitions of bullying; however, even 1-2 incidents per 30 days can sum to a substantial number of incidents over the course of months or years. Finally, the time frame for assessment of bullying victimization (past 30 days) and suicide attempts (past 12 months) differed. However, bullying is often chronic and one study found that of those who were currently bullied, the majority were also bullied an year ago.[43]

In conclusion, we found that bullying victimization and suicide attempts are both highly prevalent among school children globally, and that those who were bullied are at approximately three-fold higher odds for suicide attempts compared to those who were not bullied. Prevention of bullying should be considered in suicide prevention strategies. Mental health practitioners should be cognizant of the fact that bullying victimization may be the cause of suicide attempts, while it is also important to assess suicidality in adolescents who are bullied. Future longitudinal studies are needed to provide more insight into causality and

the potential mediators (e.g., depression) that are involved in the bullying victimization-suicide attempt association for the establishment of effective interventions to counteract this global problem.

Figure titles and captions

Figure 1 Prevalence of (a) Past 12-Month Suicide Attempt and (b) Past 30-Day Bullying Victimization

Figure 2 Country-Wise Association Between Bullying Victimization and Suicide Attempt Estimated by Multivariable Logistic Regression

Note: Models are adjusted for age, sex, and food insecurity (proxy of socioeconomic status). Overall estimate was calculated by meta-analysis with random effects. AFR = African Region; AMR = Region of the Americas; EMR = Eastern Mediterranean Region; OR = Odds ratio; SEAR = South-East Asia Region; WPR = Western Pacific Region

Figure 3 Association Between Number of Days Bullied in Past 30 Days and Suicide Attempts

Note: (b) Estimates were obtained by meta-analyses with random effects based on country-wise estimates obtained by multivariable logistic regression analysis adjusted for age, and food insecurity. Reference category is ‘0 days’. OR = Odds ratio

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Table 1 Survey Year, Sample Size, Response Rate, and Demographics by Country

WHO region	Country	Year	Country income level[a]	Response rate (%)[b]	N[c]	Boys (%)[c,d]	Mean age (years)[c,d]
AFR	Benin	2009	L	90	1,170	66.1	14.2
	Ghana	2012	LM	82	1,110	49.1	13.8
	Malawi	2009	L	94	2,224	51.5	14.0
	Mauritania	2010	LM	70	1,285	53.2	14.2
	Mozambique	2015	L	80	668	49.6	14.1
	Namibia	2013	UM	89	1,936	42.9	14.1
	Seychelles	2015	H	82	2,061	49.5	13.5
	Swaziland	2013	LM	97	1,318	39.1	14.1
	Tanzania	2014	L	87	2,615	46.8	13.6
AMR	Antigua and Barbuda	2009	UM	67	1,235	51.4	13.9
	Argentina	2012	UM	71	21,528	47.7	13.9
	Bahamas	2013	H	78	1,308	47.3	13.4
	Belize	2011	LM	88	1,600	48.4	13.6
	Bolivia	2012	LM	88	2,804	49.7	14.0
	Costa Rica	2009	UM	72	2,265	49.6	14.0
	Curaçao	2015	H	83	1,498	49.8	13.9
	Dominica	2009	UM	84	1,310	50.4	13.6
	El Salvador	2013	LM	88	1,615	50.6	14.0
	Guatemala	2015	LM	82	3,611	50.9	13.9
	Honduras	2012	LM	79	1,486	46.1	13.6
	Jamaica	2010	UM	72	1,204	49.7	14.3
	Peru	2010	UM	85	2,359	49.9	14.1
	St. Kitts and Nevis	2011	H	70	1,471	50.2	14.2
	Suriname	2009	UM	89	1,046	45.4	14.0
	Trinidad and Tobago	2011	H	90	2,363	49.5	13.6
	Uruguay	2012	H	77	2,869	46.3	14.1
EMR	Afghanistan	2014	L	79	1,493	53.4	14.0
	Iraq	2012	UM	88	1,533	54.7	13.9
	Kuwait	2015	H	78	2,034	49.4	14.1
	Lebanon	2011	UM	87	1,982	46.6	13.7
	Morocco	2010	LM	92	2,405	52.9	13.7
	United Arab Emirates	2010	H	91	2,302	39.9	14.0
SEAR	Bangladesh	2014	LM	91	2,753	63.4	14.0
	East Timor	2015	LM	79	1,631	46.3	14.1
	Indonesia	2015	LM	94	8,806	49.2	13.5
	Maldives	2014	UM	60	1,781	49.3	14.4
	Thailand	2015	UM	89	4,132	49.6	13.7
WPR	Brunei Darussalam	2014	H	65	1,824	48.2	14.0
	Cambodia	2013	L	85	1,812	48.4	14.1
	Kiribati	2011	LM	85	1,340	45.5	14.0
	Laos	2015	LM	70	1,644	47.8	14.5
	Malaysia	2012	UM	89	16,273	49.5	14.0
	Mongolia	2013	LM	88	3,707	49.4	13.7
	Philippines	2015	LM	79	6,162	48.1	13.9
	Samoa	2011	LM	79	2,200	47.4	14.0
	Solomon Islands	2011	LM	85	925	52.1	14.1
	Tuvalu	2013	UM	90	679	48.9	13.3
	Vanuatu	2011	LM	72	852	49.5	13.5

Note: AFR = African Region; AMR = Region of the Americas; EMR = Eastern Mediterranean Region; H = High income; L = Low income; LM = Lower middle income; SEAR = South-East Asia Region; UM = Upper middle income; WPR = Western Pacific Region.

[a] Country income level was based on the World Bank classification at the year of the survey in the respective countries.

[b] Response rate was calculated as school response rate multiplied by student response rate.

[c] Based on sample aged 12- 15 years.

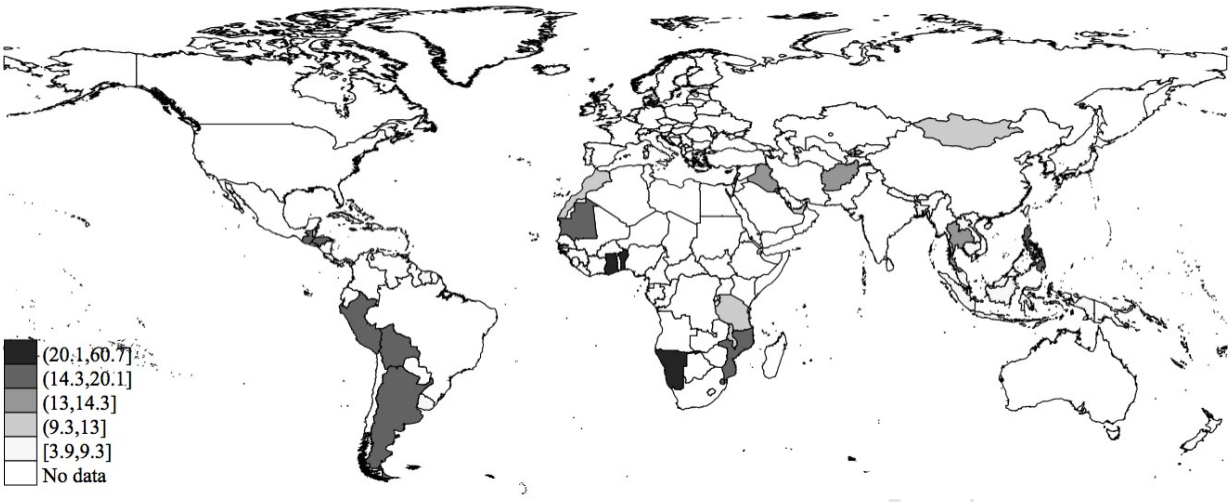
[d] Estimates are based on weighted sample.

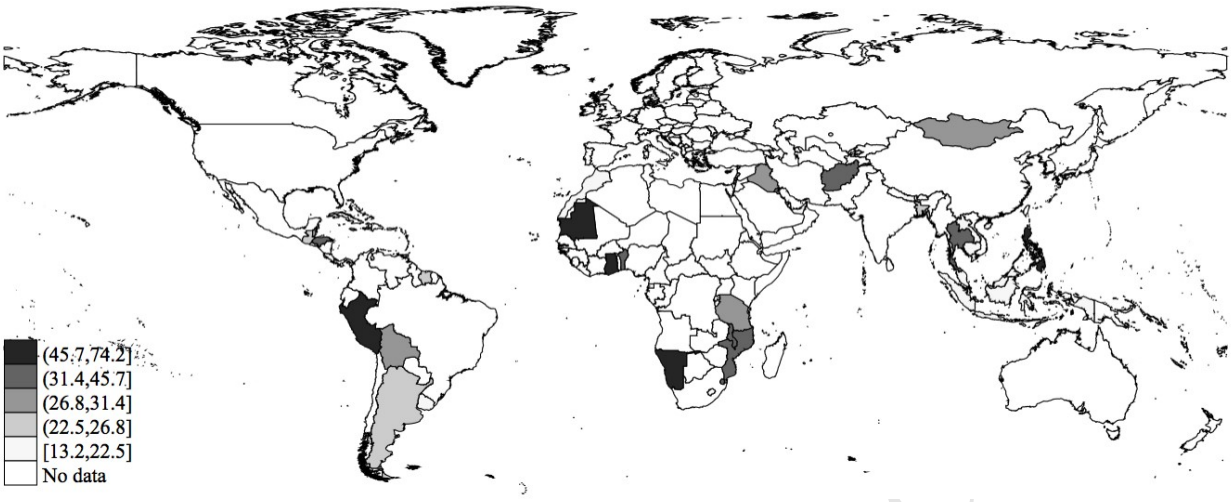
Table 2 Prevalence of Past 12-Month Suicide Attempt and Past 30-Day Bullying Victimization by Country and Sex

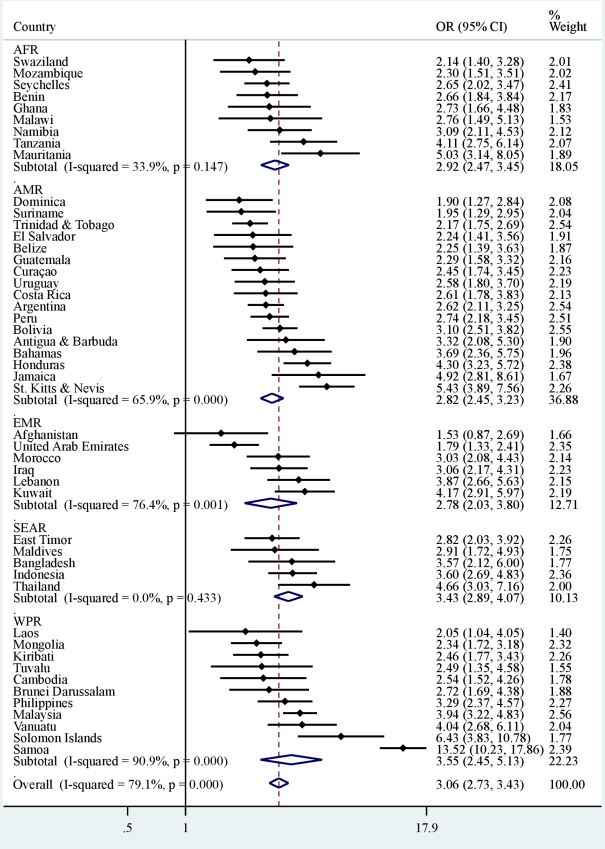
		Suicide attempt			Bullying victimization		
WHO region	Country	Overall	Boys	Girls	Overall	Boys	Girls
AFR	Benin	28.8 (24.9-33.0)	30.1 (25.1-35.6)	26.4 (21.6-31.8)	42.0 (35.9-48.3)	42.6 (36.2-49.2)	40.7 (32.7-49.2)
	Ghana	26.6 (20.8-33.3)	25.9 (19.9-33.0)	27.5 (20.0-36.5)	62.8 (57.6-67.7)	61.9 (55.5-68.0)	63.9 (58.3-69.1)
	Malawi	11.2 (6.4-18.8)	11.2 (5.9-20.2)	10.7 (6.1-18.0)	44.9 (40.2-49.7)	43.0 (37.2-49.0)	46.1 (40.7-51.7)
	Mauritania	17.7 (11.1-27.0)	18.4 (11.1-29.1)	16.3 (9.4-26.8)	47.5 (39.3-55.9)	48.9 (41.5-56.4)	45.9 (35.0-57.3)
	Mozambique	16.8 (12.5-22.3)	17.1 (13.0-22.2)	16.7 (10.6-25.4)	45.7 (36.3-55.4)	45.4 (36.7-54.4)	47.2 (35.4-59.4)
	Namibia	26.2 (22.1-30.8)	29.7 (24.9-35.0)	23.5 (19.2-28.4)	45.9 (41.6-50.3)	47.2 (42.9-51.5)	44.7 (39.4-50.2)
	Seychelles	21.1 (18.1-24.5)	21.6 (18.0-25.7)	20.7 (17.4-24.5)	50.8 (47.1-54.6)	49.8 (45.2-54.4)	51.9 (47.4-56.3)
	Swaziland	15.3 (12.7-18.3)	15.2 (11.6-19.7)	15.1 (12.1-18.5)	32.1 (29.4-35.0)	33.5 (29.1-38.2)	31.1 (27.3-35.2)
	Tanzania	11.1 (8.8-13.9)	10.3 (7.9-13.4)	11.4 (8.7-14.8)	26.9 (23.5-30.7)	26.0 (21.9-30.5)	27.3 (23.0-32.1)
AMR	Antigua and Barbuda	12.2 (10.2-14.5)	9.0 (6.8-11.9)	15.6 (12.1-19.9)	25.1 (21.9-28.5)	23.4 (19.3-28.0)	27.2 (22.5-32.5)
	Argentina	15.9 (14.5-17.5)	13.0 (10.7-15.6)	18.4 (16.7-20.2)	24.4 (22.9-25.9)	24.6 (22.1-27.2)	24.1 (22.1-26.3)
	Bahamas	13.8 (11.3-16.7)	12.8 (9.1-17.8)	14.4 (12.0-17.2)	23.7 (20.7-26.9)	24.7 (20.1-30.1)	22.3 (18.2-27.0)
	Belize	12.0 (10.1-14.4)	10.1 (8.0-12.7)	13.8 (10.7-17.5)	30.7 (26.4-35.2)	31.5 (26.8-36.7)	29.9 (25.5-34.6)
	Bolivia	20.1 (17.9-22.4)	15.5 (12.8-18.6)	24.6 (22.0-27.3)	30.5 (28.5-32.5)	32.0 (29.3-34.7)	28.4 (25.8-31.3)
	Costa Rica	8.0 (7.1-9.1)	6.0 (5.2-7.0)	9.9 (8.4-11.7)	19.1 (17.1-21.2)	18.6 (15.3-22.4)	19.5 (16.7-22.8)
	Curaçao	12.3 (10.2-14.7)	10.2 (7.7-13.2)	14.4 (11.6-17.7)	26.8 (23.6-30.3)	26.9 (22.5-31.8)	26.8 (23.1-30.9)
	Dominica	13.9 (11.8-16.3)	13.3 (10.2-17.0)	14.5 (11.8-17.7)	27.0 (23.8-30.4)	27.9 (23.2-33.2)	26.1 (22.5-29.9)
	El Salvador	12.3 (10.3-14.6)	8.7 (5.9-12.5)	15.8 (13.3-18.7)	22.5 (19.2-26.1)	21.0 (17.0-25.6)	24.0 (19.9-28.5)
	Guatemala	16.9 (13.4-21.2)	13.5 (9.4-19.1)	20.3 (15.3-26.5)	23.1 (19.7-26.8)	25.9 (21.4-31.0)	20.4 (17.3-24.0)
	Honduras	17.1 (14.4-20.3)	11.5 (9.0-14.5)	22.0 (18.0-26.7)	32.3 (29.1-35.7)	32.2 (28.5-36.1)	32.4 (27.0-38.3)
	Jamaica	22.3 (16.8-28.9)	21.4 (14.7-30.1)	23.4 (16.5-32.2)	40.4 (34.8-46.2)	40.6 (33.6-47.9)	39.2 (32.1-46.8)
	Peru	17.1 (15.2-19.3)	12.3 (10.0-15.0)	21.9 (19.4-24.8)	47.2 (44.6-49.9)	46.5 (43.4-49.7)	48.1 (44.7-51.5)
	St. Kitts and Nevis	13.8 (12.1-15.6)	14.5 (12.0-17.5)	13.1 (10.9-15.5)	22.6 (20.5-24.9)	25.2 (21.9-28.8)	20.4 (17.7-23.4)
	Suriname	7.8 (6.2-9.8)	4.3 (2.2-8.3)	10.5 (8.5-12.8)	26.2 (22.9-29.8)	26.3 (22.7-30.2)	25.9 (21.8-30.4)
	Trinidad and Tobago	13.1 (11.2-15.3)	11.3 (9.1-14.1)	14.7 (12.0-17.9)	14.6 (12.9-16.4)	17.2 (14.0-20.9)	11.9 (9.6-14.6)
	Uruguay	9.2 (7.5-11.2)	7.3 (5.5-9.7)	10.8 (8.6-13.6)	19.1 (17.3-21.1)	17.6 (15.4-20.1)	20.5 (18.1-23.2)

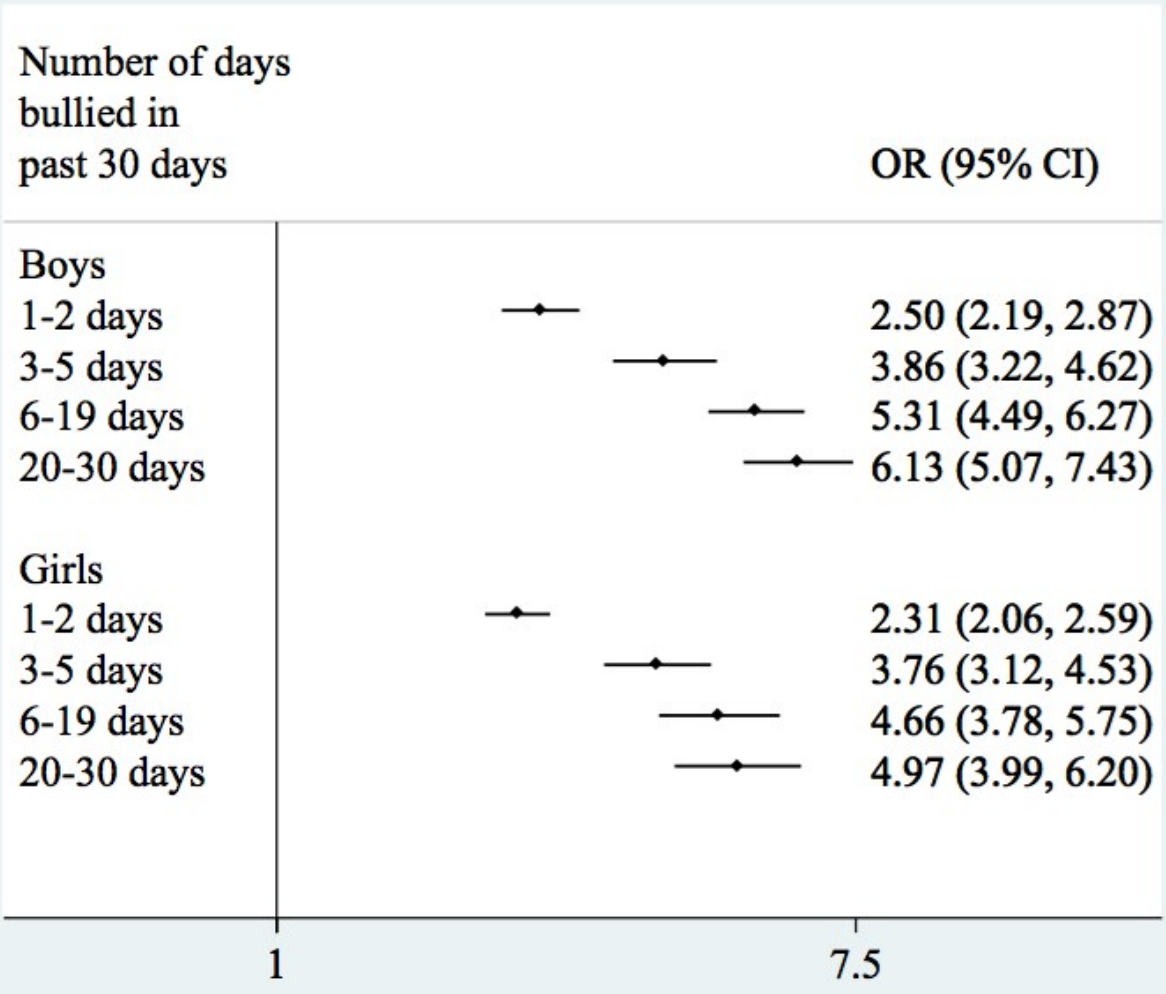
EMR	Afghanistan	13.7 (10.6-17.5)	13.0 (9.5-17.7)	12.2 (9.3-15.9)	43.8 (38.1-49.7)	41.8 (31.0-53.4)	44.2 (37.6-51.0)
	Iraq	14.3 (12.0-16.9)	13.4 (10.8-16.5)	15.3 (11.6-20.0)	28.3 (24.2-32.9)	32.7 (27.7-38.1)	22.9 (18.6-28.0)
	Kuwait	15.8 (13.3-18.8)	14.5 (9.8-20.8)	16.8 (12.7-22.0)	31.6 (27.3-36.2)	35.5 (29.7-41.7)	27.7 (23.9-31.9)
	Lebanon	13.0 (11.3-14.9)	12.9 (11.0-15.2)	13.1 (9.9-17.1)	24.9 (22.8-27.1)	34.9 (31.1-38.9)	16.1 (12.4-20.6)
	Morocco	13.0 (10.7-15.7)	11.3 (8.8-14.3)	14.8 (11.4-18.9)	18.5 (15.6-21.7)	17.2 (14.6-20.0)	19.9 (16.0-24.5)
	United Arab Emirates	12.5 (10.5-14.9)	12.2 (9.9-15.0)	12.5 (9.9-15.6)	22.5 (20.1-25.1)	25.7 (22.8-28.8)	20.1 (17.1-23.5)
SEAR	Bangladesh	6.9 (5.3-9.0)	7.2 (5.2-10.1)	6.0 (4.2-8.4)	23.7 (20.5-27.2)	27.3 (23.1-31.9)	17.3 (14.1-21.1)
	East Timor	10.0 (7.2-13.7)	9.6 (6.4-14.1)	8.0 (5.3-12.0)	31.3 (27.8-34.9)	37.9 (32.2-43.9)	24.9 (21.0-29.3)
	Indonesia	3.9 (3.2-4.9)	4.4 (3.3-5.9)	3.4 (2.8-4.2)	21.0 (19.1-23.0)	23.9 (21.3-26.8)	18.2 (16.3-20.2)
	Maldives	13.6 (11.6-15.9)	15.0 (12.3-18.2)	11.7 (9.6-14.2)	30.4 (27.6-33.4)	30.4 (26.8-34.2)	29.8 (26.4-33.3)
	Thailand	14.0 (10.9-17.7)	15.6 (11.5-21.0)	12.2 (9.9-15.1)	32.7 (28.6-37.1)	39.1 (33.1-45.3)	26.5 (23.4-29.8)
WPR	Brunei Darussalam	5.2 (4.2-6.3)	4.3 (3.0-6.1)	6.0 (4.7-7.6)	23.3 (21.1-25.8)	25.2 (21.5-29.2)	21.7 (19.1-24.5)
	Cambodia	7.2 (5.7-9.0)	6.4 (4.5-9.0)	8.0 (6.2-10.3)	22.2 (18.3-26.5)	22.5 (19.2-26.2)	21.7 (15.9-28.9)
	Kiribati	30.8 (27.3-34.5)	30.2 (24.9-36.2)	31.3 (28.1-34.7)	36.8 (33.3-40.6)	42.3 (38.6-46.0)	32.3 (27.1-37.9)
	Laos	5.9 (4.5-7.7)	4.9 (3.3-7.3)	6.9 (5.0-9.4)	13.2 (10.3-16.6)	15.2 (11.6-19.5)	11.3 (8.0-15.8)
	Malaysia	7.0 (6.3-7.9)	6.7 (5.7-7.7)	7.4 (6.5-8.4)	21.0 (19.6-22.5)	24.1 (22.5-25.8)	17.9 (16.3-19.6)
	Mongolia	9.5 (8.4-10.7)	7.9 (6.6-9.5)	11.0 (9.5-12.6)	31.4 (28.8-34.1)	37.2 (34.1-40.4)	25.6 (23.1-28.3)
	Philippines	16.4 (13.2-20.2)	14.7 (11.5-18.6)	17.9 (14.2-22.5)	51.5 (47.9-55.0)	53.8 (50.1-57.5)	49.3 (45.2-53.4)
	Samoa	60.7 (52.8-68.1)	67.8 (60-74.7)	54.0 (45.5-62.4)	74.2 (68.2-79.3)	79.0 (73.6-83.5)	69.1 (61.7-75.6)
	Solomon Islands	32.7 (23.5-43.5)	29.9 (21.9-39.4)	34.3 (23.2-47.4)	65.7 (57.5-73.1)	63.1 (54.4-71.1)	67.3 (57.0-76.1)
	Tuvalu	9.3 (7.3-11.7)	14.5 (11.1-18.8)	4.1 (2.5-6.9)	30.2 (26.7-33.9)	40.7 (35.3-46.5)	20.4 (16.4-25.1)
	Vanuatu	24.1 (17.9-31.7)	28.5 (21.5-36.7)	19.1 (12.0-29.1)	67.9 (59.6-75.3)	68.7 (59.5-76.6)	67.1 (57.3-75.6)

Note: Data are percent (95% CI). Estimates are based on weighted sample. AFR = African Region; AMR = Region of the Americas; EMR = Eastern Mediterranean Region; SEAR = South-East Asia Region; WPR = Western Pacific Region








Number of days bullied in past 30 days
OR (95% CI)
Boys
1-2 days
2.50 (2.19, 2.87)
3-5 days
3.86 (3.22, 4.62)
6-19 days
5.31 (4.49, 6.27)
20-30 days
6.13 (5.07, 7.43)
Girls
1-2 days
2.31 (2.06, 2.59)
3-5 days
3.76 (3.12, 4.53)
6-19 days
4.66 (3.78, 5.75)
20-30 days
4.97 (3.99, 6.20)
1
7.5

	0 days	1-2 days	3-5 days	6-19 days	20-30 days
Overall	5.9	15.8	24.9	28	32.7
Boys	5.3	13.9	22.1	26.5	30.8
Girls	6.5	17.6	28.5	29.3	34.6

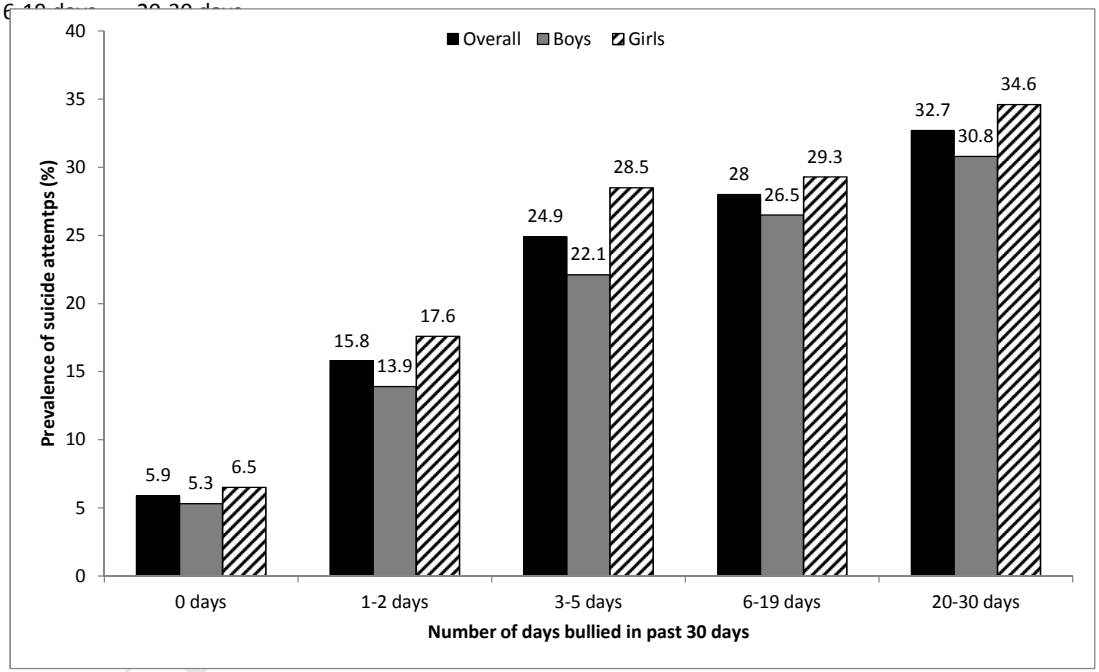


Table S1 Prevalence of Different Types of Bullying (Most Frequent Type in Past 30 Days) by Country

WHO region	Country	Hit, kicked, pushed, shoved around, or locked indoors	Made fun of because of race, nationality, or color	Made fun of because of religion	Made fun of with sexual jokes, comments, or gestures	Left out of activities on purpose or completely ignored	Made fun of because of how body or face looks	Other
AFR	Benin	22.4	22.2	21.6	9.4	1.7	7.6	15.1
	Ghana	33.0	19.0	9.4	6.4	4.7	10.1	17.4
	Malawi	16.7	17.1	15.9	7.5	10.9	14.1	17.9
	Mauritania	22.0	21.0	20.5	11.2	7.9	4.0	13.3
	Mozambique	48.0	13.4	7.1	10.1	1.8	4.2	15.4
	Namibia	22.2	13.2	5.2	8.1	4.8	18.2	28.3
	Seychelles	12.3	13.1	4.4	6.9	2.9	15.4	44.8
	Swaziland	22.8	10.7	3.8	4.0	3.9	19.8	34.9
	Tanzania	26.3	16.4	8.3	6.4	8.2	11.7	22.7
AMR	Antigua & Barbuda	14.4	15.2	4.7	10.9	1.4	22.8	30.6
	Argentina	9.4	7.6	3.1	13.9	6.8	25.2	34.1
	Bahamas	12.3	9.6	5.0	11.4	6.8	24.3	30.6
	Belize	16.7	10.9	4.4	7.2	5.2	21.1	34.6
	Bolivia	13.1	9.5	6.7	11.3	6.9	15.4	37.1
	Costa Rica	8.1	5.6	1.6	14.9	7.4	26.8	35.6
	Curaçao	3.4	9.0	1.5	18.8	5.4	24.2	37.8
	Dominica	19.7	9.4	3.1	11.5	3.9	19.1	33.2
	El Salvador	7.8	12.7	4.5	12.6	7.9	19.5	35.0
	Guatemala	16.8	13.3	2.6	11.9	7.3	16.9	31.1
	Honduras	7.6	9.1	4.9	14.2	9.8	18.9	35.4
	Jamaica	19.4	17.8	7.1	10.4	3.9	14.8	26.5
	Peru	9.8	6.8	4.6	11.3	10.5	17.6	39.4
	St. Kitts & Nevis	21.5	12.9	5.6	12.0	4.3	16.4	27.3
	Suriname	4.3	7.1	1.3	6.0	1.2	18.1	62.0
	Trinidad & Tobago	18.5	12.0	4.6	11.0	3.1	18.7	32.2
	Uruguay	4.3	5.7	1.3	18.9	7.2	31.1	31.5
EMR	Afghanistan	19.2	15.1	12.8	22.6	12.9	6.7	10.7
	Iraq	32.4	14.2	7.1	13.0	2.9	6.4	24.1
	Kuwait	18.2	13.5	6.4	9.3	2.7	22.7	27.2
	Lebanon	22.8	15.9	7.5	15.4	1.5	5.8	31.1
	Morocco	NA	NA	NA	NA	NA	NA	NA
	United Arab Emirates	14.1	10.5	2.6	14.6	6.4	16.1	35.8
SEAR	Bangladesh	NA	NA	NA	NA	NA	NA	NA
	East Timor	26.7	8.3	10.7	30.0	5.2	2.4	16.8
	Indonesia	13.0	6.9	3.1	20.6	5.5	19.1	31.8
	Maldives	6.1	10.4	4.1	11.5	4.7	18.2	44.9
	Thailand	22.8	10.0	2.8	30.2	3.3	9.2	21.5
WPR	Brunei Darussalam	8.9	9.3	1.8	7.3	6.2	22.4	44.0
	Cambodia	9.3	25.6	5.1	15.9	12.5	20.8	10.8
	Kiribati	27.7	7.9	15.4	29.4	1.7	9.3	8.6
	Laos	36.3	9.3	1.9	5.9	3.5	14.1	29.1
	Malaysia	14.2	11.4	3.9	19.4	4.4	19.5	27.3

Mongolia	21.7	3.5	1.3	2.8	22.9	14.5	33.3
Philippines	16.5	20.4	3.2	24.7	5.5	13.4	16.2
Samoa	20.8	23.8	17.3	10.5	5.4	8.5	13.8
Solomon Islands	23.8	20.0	7.8	9.0	5.7	8.7	25.0
Tuvalu	33.5	16.2	8.4	5.1	3.4	6.1	27.3
Vanuatu	33.8	14.8	6.2	8.1	3.6	11.9	21.5

Data are weighted percentage.
Sample is restricted to those who were bullied in the past 30 days.
Abbreviation: AFR = African Region; AMR = Region of the Americas; EMR = Eastern Mediterranean Region; SEAR = South-East Asia Region; WPR = Western Pacific Region

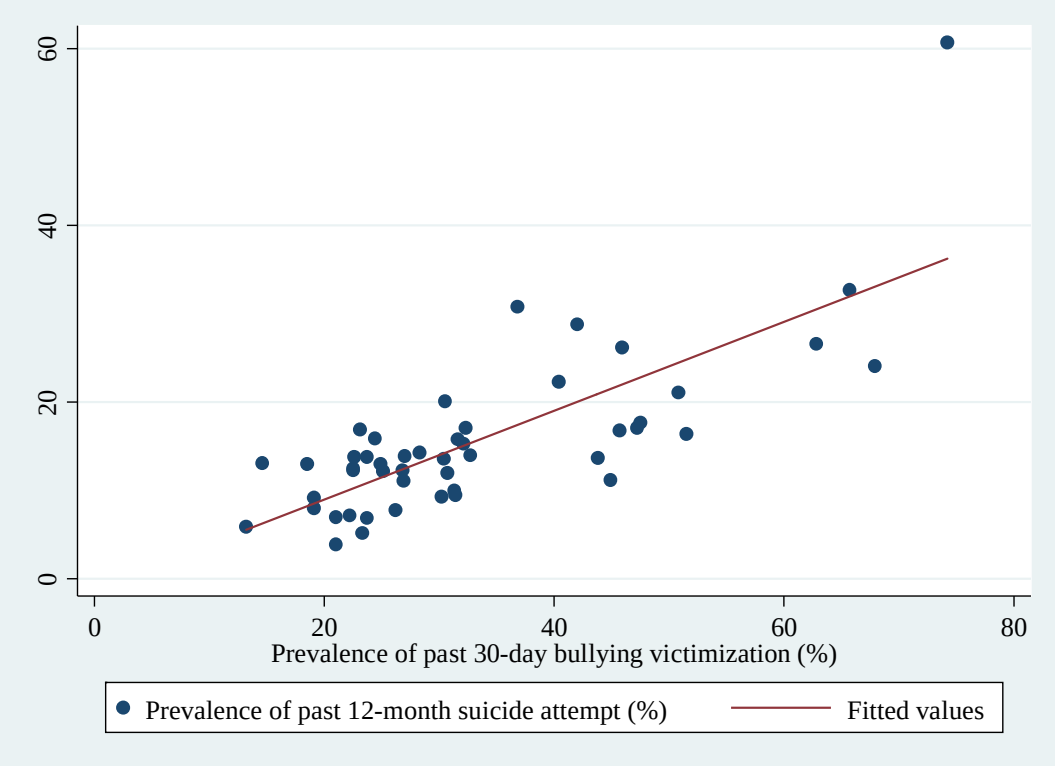


Figure S1 Scatter Plot of the Prevalence of Past-30 Day Bullying Victimization by Past-12 Month Suicide Attempt by Country

Note: Each dot represents a country. Coefficient based on linear regression :0.50 (95%CI=0.38-0.63; p<0.0001).

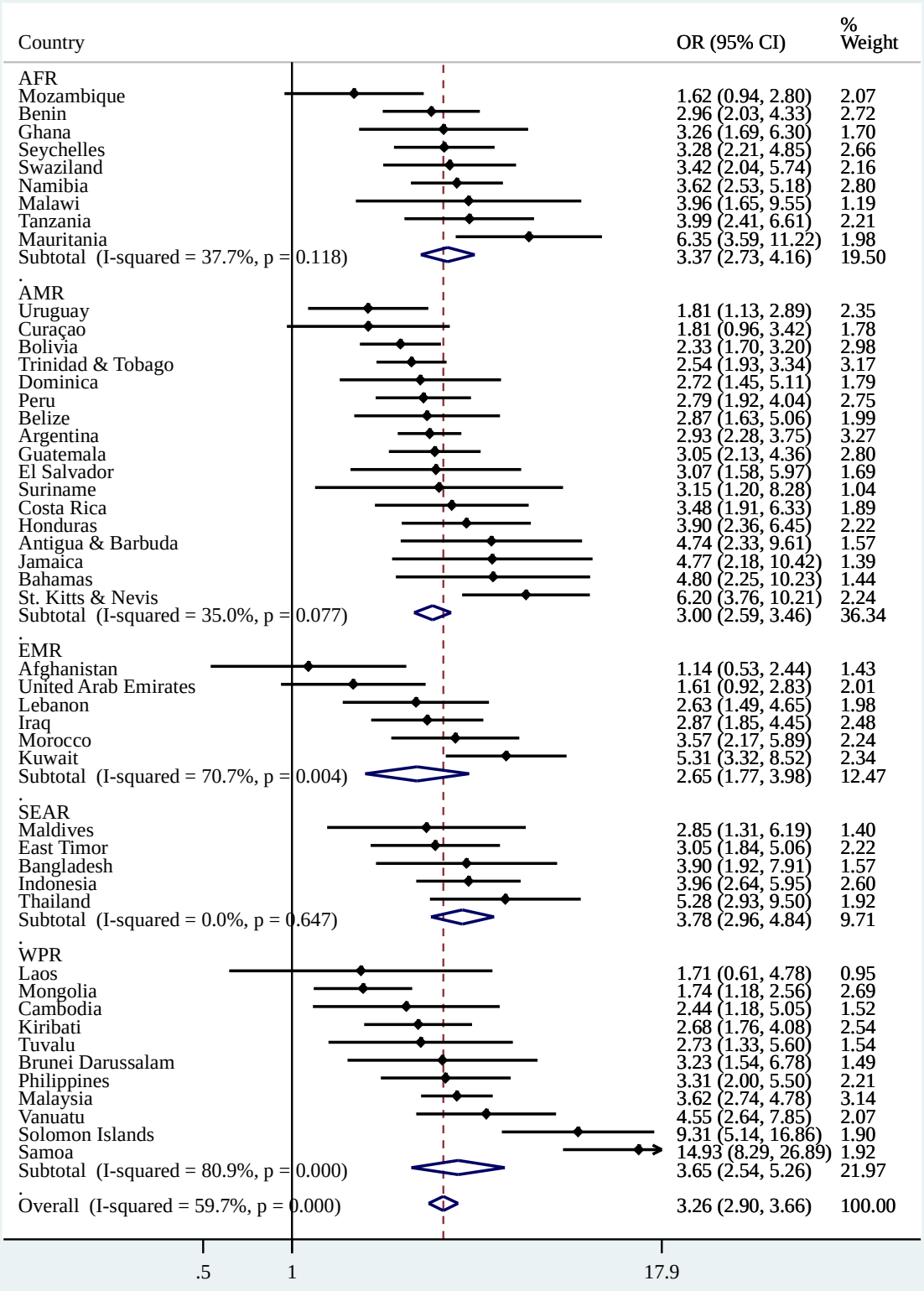


Figure S2 Country-wise Association between Bullying Victimization and Suicide Attempt Estimated by Multivariable Logistic Regression among Males

Note: Models are adjusted for age and food insecurity (proxy of socioeconomic status). Overall estimate was calculated by meta-analysis with random effects. AFR = African Region; AMR = Region of the Americas; EMR = Eastern Mediterranean Region; OR = Odds ratio; SEAR = South-East Asia Region; WPR = Western Pacific Region.

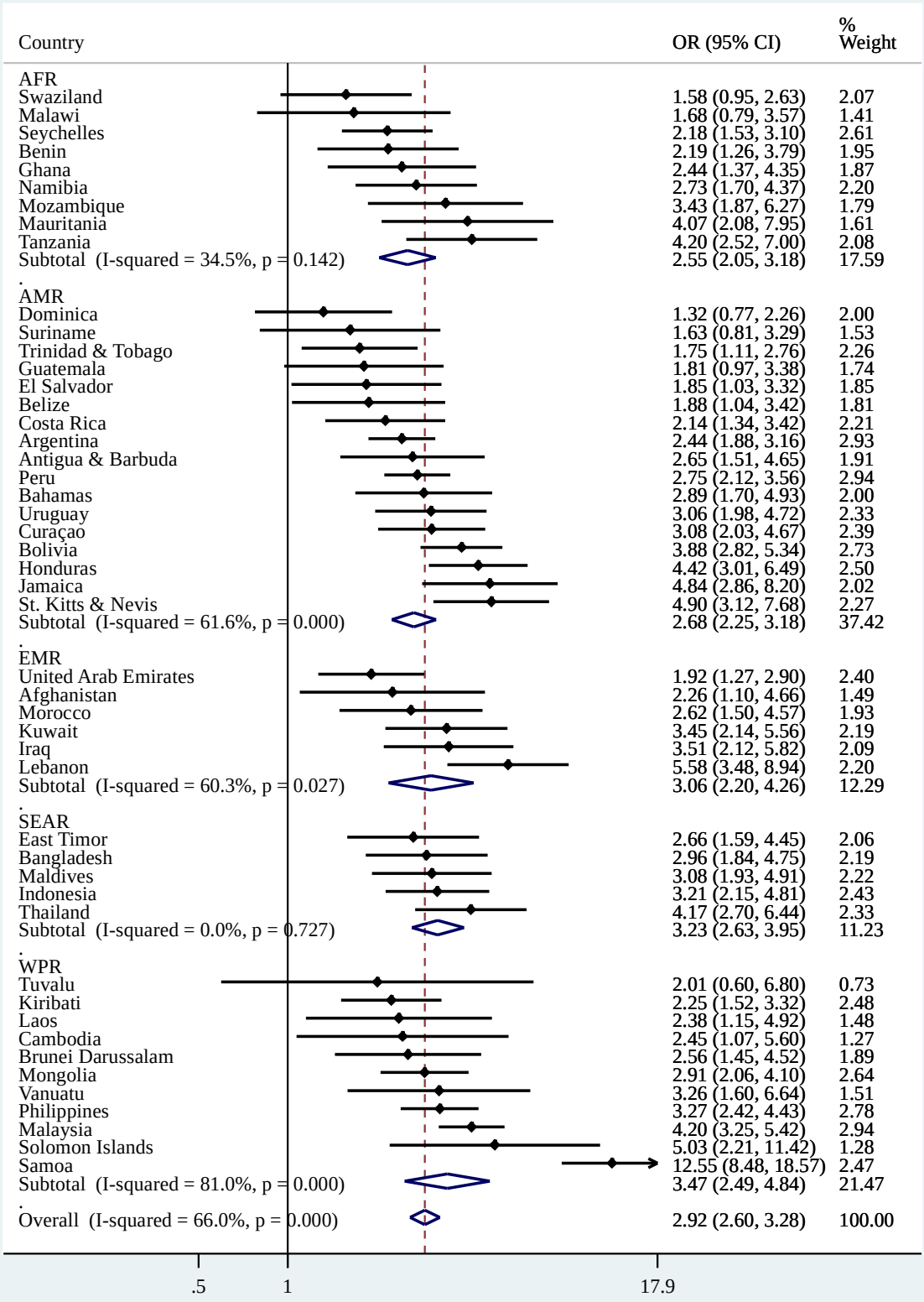


Figure S3 Country-wise Association between Bullying Victimization and Suicide Attempt Estimated by Multivariable Logistic Regression among Females

Note: Models are adjusted for age and food insecurity (proxy of socioeconomic status). Overall estimate was calculated by meta-analysis with random effects. AFR = African Region; AMR = Region of the Americas; EMR = Eastern Mediterranean Region; OR = Odds ratio; SEAR = South-East Asia Region; WPR = Western Pacific Region.